UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/587,194	07/24/2006	Jean-Louis Stehle	58059/N75	8444

23363 7590 08/03/2009

CHRISTIE, PARKER & HALE, LLP
PO BOX 7068
PASADENA, CA 91109-7068

EXAMINER	
JELSMA, JONATHAN G	
ART UNIT	PAPER NUMBER
1795	
MAIL DATE	DELIVERY MODE
08/03/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/587,194	STEHLE, JEAN-LOUIS	
	Examiner	Art Unit	
	Jonathan Jelsma	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 May 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Summary

1. This is the second office action based on application 10/587,194 and in response to Applicant Arguments/Remarks filed 05/28/2009.

2. Claims 1-18 are previously pending. Claims 1, 13-15, and 17-18 have been amended, and claim 19 is a newly added claim. Claim 19 has been withdrawn from consideration as being drawn to non-elected subject matter. All amendments have been entered. Claims 1-18 are currently pending and have been fully considered.

Election/Restrictions

3. Newly submitted claim 19 is directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: Claim 19 is directed to a method of forming a mask, whereas the original claims were to the mask itself. In the present case, the mask as claimed can be made by another and materially different method such as a method that includes vapor deposition of the protective means onto the reflective structure.

4. Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claim 19 is withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1, 3-4, 6-7, and 11 are rejected under 35 U.S.C. 102(b) as being anticipated by SCOTT (US 5,935,733).

7. With respect to claims 1, 4, and 11. SCOTT teaches a reflective mask comprising, a mask substrate with a reflective surface, which may be thin films of alternating reflective and transmissive materials (column 8 lines 19-22, 45-48) it is noted that this embodiment does not teach phase shifting. The reflective mask may be used in the 13 nm wavelength regime (column 8 lines 45-46). There is also formed an absorbing layer (column 9 lines 60-65) which forms a mask pattern as seen in figure 6c. There is formed a transmissive layer 260 (column 8 lines 58-63). The thickness of this transmissive layer 260 may be, for example, between 100-150 nm in thickness (column 8 lines 58-60). A transmissive capping layer may be formed over the surface of the transmissive layer 260, and absorber pattern 280 (column 10 lines 41-52). The capping layer 300 is the same material as the transmissive layer 260 (column 10 lines 44-59). The combination of the transmissive layer 260 and the capping layer 300 is the protective means of the present claims, and contacts the reflective structure 255, as can be seen in figure 7. The resulting mask with a capping material layer as a protective coating is similar to a pellicle, because it protects the mask (column 11 lines 7-15).

8. SCOTT does not explicitly teach that the protective layer keeps any interfering particles at a distance from the mask pattern that is greater than or equal to the depth of focus of the device, or the height of the pattern interfering particle. However, SCOTT does teach that the thickness of the transmissive layer 260 may be between 100-150 nm in thickness (column 8 lines 58-60) and that the thickness of the capping layer, 300, should be the maximum thickness possible to enable a substantially defect free film and adequately protect the mask structure while providing for clean and accurate transmission of incident light (column 10 lines 57-62). Therefore, since the protective means is the combination of the transmissive layer 260 and the capping layer 300, the entire thickness of the protective means will still be greater than 100-150 nm, since that is the thickness of the transparent layer, 260 (column 8 lines 58-60). Claim 12 of the present invention defines that this distance that satisfies the requirement for the protective layer to keep any interfering particles at a distance from the mask pattern that is greater than or equal to the depth of focus of the device, or the height of the pattern interfering particle is between 50 nm and 5000 nm. Since SCOTT at the minimum teaches a protective means of 100-150 nm, it must inherently also satisfy the requirement, since it is at least greater than 50 nm.

9. With respect to claim 3 (as dependent upon claim 1). The transmissive layer may be subject to a planarization step (column 10 lines 16-21). Similarly the capping layer is also planarized (column 10 lines 54-58). These layers are put on in order to insure no loss of effectiveness (column 10 lines 54-54). Further these layers are formed

in order to ensure accurate transmission of incident light (column 10 lines 58-61). Therefore, using these methods the deflection of the beam would be negligible.

10. With respect to claim 6. SCOTT teaches that the reflective mask with the capping material may be considered a kind of pellicle, which acts as a protective coating (column 11 lines 7-10). The function of these pellicles is to protect the mask from cleaning of particles (column 2 lines 39-55).

11. With respect to claim 7. The mask with the protective means is capable of being inspected. Specifically SCOTT teaches using an inspection tool such as a KLA 351 (column 9 lines 39-42).

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

13. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

14. Claims 1-7, 9-11, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over ENLOE (US 2003/0186131 A1) in view of TEJNIL (US 2004/0200572 A1).

15. ENLOE teaches a reflective mask assembly comprising a reflective mask 1100, a pellicle spacer 1200, and an electrostatic pellicle system 300 (paragraph 0024). The exposure light for the reflective mask system is extreme ultraviolet light, which may have a nominal wavelength of 11.0-15.0 nm (paragraph 0025). The exposure light is incident reflective mask at an angle of, for example 83.0-85.0 degrees through the protective pellicle structure, indicating negligible deflection or diffraction of the beam (paragraph 0025, Fig 1b). The reflective mask may include a patterned absorber layer 1120 that is located over a surface of a reflective substrate 1110 (paragraph 0027). Wherein, the reflective substrate may be a multilayer reflective substrate comprising alternating layers of molybdenum and silicon (paragraph 0028). The reflective substrate is located over a surface of a low thermal expansion material 1115 (paragraph 0028). The pellicle spacer separates the reflective mask from the pellicle system by a stand-off distance, which may be about 1.0-6.0 mm (paragraph 0030), which is greater than the inventions distance of 5000 nm as defined by claim 12 for example, and so is therefore taken to being greater than the depth of focus and height of pattern/interfering particle. The pellicle system is designed to keep contamination away from the vicinity of the mask during exposure (paragraph 0013). This pellicle system of the membrane and spacers is the claimed protective means and is shown to be in contact with the reflective layer in figure 1(b).

16. ENLOE teaches using electrostatic forces to collect contaminants, so that they do not interfere with the exposure radiation (paragraph 0061) this may be considered a cleaning process. Electrostatic forces are used to counteract and overcome other forces, such as gravitational and aerodynamic forces (paragraph 0062). Electrostatic forces are applied with appropriate directions and sufficiently large magnitudes, so that positively charged particles are attracted to a negatively charged surface, and negatively charged particles are attracted to positively charged surface (paragraph 0062), or conversely the particles are repelled by the same charged surfaces. Initially uncharged or neutral particles may also respond to the electrostatic forces if a charge is first induced on the particle by an electric field (paragraph 0062). Additionally the contaminant may include water (paragraph 0059), therefore, ENLOE teaches repelling the water contaminant using electrostatic forces, meaning that it may be hydrophobic. Additionally ENLOE teaches measuring, or inspecting, the pellicle at the wavelength of the exposure radiation, using a tunable diode laser absorption spectroscopy (paragraph 0059). Since it is capable of being inspected at the exposure wavelength, it would necessarily also be capable of being inspected at visible wavelengths.

17. ENLOE does not explicitly teach that the spacers are transparent, and therefore the protective means that is connected to the reflective portion is not explicitly taught being transparent.

18. TEJNIL however, teaches forming a pellicle frame of a material that is transparent to radiation (paragraph 0027). Specifically this allows the curing of an

adhesive to attach the pellicle to the mask by imaging light through the frame (paragraph 0027).

19. At the time of the invention one having ordinary skill in the art would have been motivated to use the transparent pellicle frame of TEJNIL to support the pellicle of ENLOE in order to have the added benefit of being able to cure the adhesive with light guided through the pellicle frame (TEJNIL paragraph 0027). This method allows mounting of a hard or soft pellicle with reduced stress and reduced distortion of the pellicle and mask (paragraph 0029).

20. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over ENLOE (US 2003/0186131 A1) in view of TEJNIL (US 2004/0200572 A1) and further in view of KLEBANOFF (US 6,492,067 B1).

21. Claim 8 is dependent upon claim 1, which is rejected above under 35 U.S.C. 103(a) in view of ENLOE and TEJNIL. ENLOE teaches a method of keeping contaminants away from a vicinity of a mask with a pellicle, specifically by using the electrostatic effect (abstract). ENLOE does not explicitly teach that the protective structure, the pellicle, has a conductive structure capable of thermophoresis.

22. KLEBANOFF teaches a protective pellicle system which employs the thermophoretic effect to keep particles off the mask (abstract). KLEBANOFF teaches that incorporating thermophoresis provides added particle protection (column 3 lines 65-67). The mask of KLEBANOFF may consist of a substrate with a multilayer reflective film, with a mask patterned area on top (column 4 lines 26-33). The thermophoretic

protection may be utilized on the mask area itself (column 7 lines 20-23). The patterned mask area is warmer than its surroundings; thermophoresis may be used as a source of particle protection (column 8 lines 43-46).

23. At the time of the invention one having ordinary skill in the art would have been motivated to include the thermophoresis method of KLEBANOFF to mask pellicle system of ENLOE, because KLEBANOFF teaches that the thermophoresis effect is advantageous to give added particle protection (column 3 lines 65-67) as well as a way to counteract any particle contamination from the electrostatic effect of ENLOE (column 7 lines 10-14).

24. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over ENLOE (US 2003/0186131 A1) in view of TEJNIL (US 2004/0200572 A1), and further in view of LEVINSON (US 6,623,893 B1).

25. Claim 13 is dependent upon claim 1 which is rejected above under 35 U.S.C. 103(a) in view of ENLOE and TEJNIL. However, ENLOE does not explicitly teach that the pellicle, protective structure, comprises at least one antireflective layer.

26. LEVINSON teaches the coating of a pellicle membrane with an anti-reflective coating (column 7 lines 18-21). LEVINSON teaches the use of the pellicle with an anti-reflective coating in order to have a high transmissivity (column 2 lines 25-30).

27. At the time of the invention one having ordinary skill in the art would have been motivated use an antireflection coating on the pellicle as taught by LEVINSON for the

pellicle of ENLOE, because LEVINSON teaches that the use of the antireflection layer on the pellicle provides excellent transmissivity (LEVINSON column 2 lines 25-30).

28. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over ENLOE (US 2003/0186131 A1) in view of TEJNIL (US 2004/0200572 A1) and further in view of LEVINSON (US 6,623,893 B1) and ANGELOPOULOS (US 2002/0012876 A1).

29. Claim 18 is dependent upon claim 13 which is rejected above under 35 U.S.C. 103(a) in view of ENLOE, TEJNIL, and LEVINSON. LEVINSON teaches forming an antireflective layer comprising a variety of materials including calcium fluoride (column 7 lines 18-21). However, LEVINSON does not explicitly teach that the material of the antireflective layer is selected from one of a polymer, carbon, carbon nanotubes, silicon, beryllium, ruthenium, silver or zirconium.

30. ANGELOPOULOS however, teaches antireflective coatings for the EUV range, which may include tunable vapor deposited silicon (paragraph 0001).

31. At the time of the invention one having ordinary skill in the art would have been motivated to use the material for the antireflective layer of silicon as taught by ANGELOPOULOS for the antireflective film of LEVINSON, since LEVINSON teaches that any acceptable material may be used, and ANGELOPOULOS teaches that the silicon is an acceptable material for the EUV range. Therefore, the material of the antireflective layer may be determined by routine experimentation by one having ordinary skill in the art.

32. Claims 2, 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over SCOTT (US 5,935,733).

33. Claim 2 is dependent upon claim 1, which is rejected above under 35 U.S.C. 102(b) in view of SCOTT. However, SCOTT does not explicitly teach that the protective means are contrived to keep the interfering particles at a distance from the patterns which is greater than or equal to the two values of the depth of focus of the device and the height of pattern/interfering particle.

34. However, SCOTT does teach that the thickness of the transmissive layer 260 may be between 100-150 nm in thickness (column 8 lines 58-60) and that the thickness of the capping layer 300 should be the maximum thickness possible to enable a substantially defect free film and adequately protect the mask structure while providing for clean and accurate transmission of incident light (column 10 lines 57-62). Therefore, SCOTT teaches that the thickness of the capping layer is a result effective variable, and one having ordinary skill in the art would have been motivated to adjust the thickness of the capping layer in order to achieve sufficient protection for the masking layer, as well as maintaining the transmissive properties. And it is further noted that the entire thickness of the protective means will still be greater than 100-150 nm, since that is the thickness of the transparent layer 260 (column 8 lines 58-60). Therefore, at the time of the invention one having ordinary skill in the art would have been motivated to adjust the thickness of the protective means as a matter of routine experimentation in order to protect the mask structure, and ensure transmission of the light (column 10 lines 58-61).

35. Claim 12 is dependent upon claim 1, which is rejected above under 35 U.S.C. 102(b) in view of SCOTT. However, SCOTT does not explicitly teach that the distance is between 50 nm and about 5000 nm.

36. However, SCOTT does teach that the thickness of the transmissive layer 260 may be between 100-150 nm in thickness (column 8 lines 58-60) and that the thickness of the capping layer 300 should be the maximum thickness possible to enable a substantially defect free film and adequately protect the mask structure while providing for clean and accurate transmission of incident light (column 10 lines 57-62). Therefore, SCOTT teaches that the thickness of the capping layer is a result effective variable, and one having ordinary skill in the art would have been motivated to adjust the thickness of the capping layer in order to achieve sufficient protection for the masking layer, as well as maintaining the transmissive properties. And it is further noted that the entire thickness of the protective means will still be greater than 100-150 nm, since that is the thickness of the transparent layer 260 (column 8 lines 58-60). Therefore, at the time of the invention one having ordinary skill in the art would have been motivated to adjust the thickness of the protective means as a matter of routine experimentation in order to protect the mask structure, and ensure transmission of the light (column 10 lines 58-61).

37. Claims 13 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over SCOTT (US 5,935,733) in view of ANGELOPOULOS (US 2002/0012876 A1).

38. Claim 13 is dependent upon claim 1, which is rejected above under 35 U.S.C. 102(b) in view of SCOTT, and claim 18 is dependent upon claim 13. SCOTT does not explicitly teach that the protective means that comprises at least one antireflective layer.

39. The protective means of SCOTT which includes layers 260 and 300 may be made of a material such as single crystal silicon, or polycrystalline silicon, or amorphous silicon (column 9 lines 1-2, and column 10 lines 46-49).

40. ANGELOPOULOS teaches that silicon layers, may function as hard masks and antireflective coatings and hardmasks for high resolution lithography, including extreme ultraviolet lithography (paragraph 0001).

41. At the time of the invention one having ordinary skill in the art would have been motivated to include the use of the antireflective layer on top of the silicon layer of SCOTT by the method of ANGELOPOULOS, because the application of the antireflective coating may increase the lithographic performance (ANGELOPOULOS paragraph 0011).

42. Claims 14-15, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over SCOTT (US 5,935,733) in view of KURT (US 2004/0130693 A1).

43. Claims 14-15, and 17 are dependent upon claim 1, which is rejected above under 35 U.S.C. 102(b) in view of SCOTT. However, SCOTT does not explicitly teach that the capping structure is composed of foam, a structure with channels, or a structure composed of nanotubes oriented in a normal direction to the front face of the reflective structure.

44. KURT using fullerenes as a capping layer to provide a stable and chemically inert protective coating, that is able to retain its initial structure for long periods of irradiation, for improved optical processing (paragraph 0021). Additionally the capping layer, may comprise the fullerene film, and a ruthenium layer on top of the fullerene layer (paragraph 0024). The fullerenes have a relatively low density and therefore a fairly thick capping layer can be used without increasing the optical absorption, which leads to an increased distance between the outer capping layer and the multi-layer mirror, and an improved diffusion barrier (paragraph 0024). KURT additionally teaches that a wide range of different fullerenes can be used (paragraph 0058), and that more densely packed and tightly bound layers can be formed by polymerizing the fullerenes to form chains or networks of molecules connected by covalent bonds (paragraph 0059). Additionally it is noted that a carbon nanotube is a form of a fullerene.

45. At the time of the invention one having ordinary skill in the art would have been motivated to use the fullerene capping layer of KURT in the EUV reflective mask of SCOTT, since SCOTT teaches that it is desirable to attain the maximum thickness of the protective layer while maintaining the optical properties (SCOTT column 10 lines 58-61), and KURT teaches the use of the fullerene capping layer in order to have a fairly thick capping layer without increasing the optical absorption (KURT paragraph 0024).

46. Additionally while KURT does not explicitly teach the fullerene capping layer to be of a foam, channeled, or oriented in a structure normal to the reflective structure, it does teach that the fullerene layer is low density (paragraph 0024). KURT also teaches that a wide range of different fullerenes can be used, as well as multi-shelled nestled

fullerenes (paragraph 0058) as well as more densely packed and tightly bound fullerenes layers (paragraph 0059). Therefore, one having ordinary skill in the art would have been motivated to form the capping layer of KURT in the form of a foam like layer, or which channels, or more densely packed, based on routine experimentation of choosing the desired structure and orientation of the fullerene material.

Response to Arguments

47. Applicant's arguments, see page 6 of Applicant Arguments/Remarks, filed 05/28/2009, with respect to 35 U.S.C. 112 second paragraph rejection of claims 12-15 have been fully considered and are persuasive. The 35 U.S.C. 112 second paragraph rejection of claims 12-15 has been withdrawn.

48. With respect to claim 12, the arguments on page 6 of Applicant Arguments/Remarks filed 05/28/2009 have overcome the rejection.

49. With respect to claims 13-15 the claim amendments have overcome the rejection.

50. Applicant's arguments, see page 7 of Applicant Arguments/Remarks, filed 05/28/2009, with respect to the rejection(s) of claim(s) 1-7, 9-11, and 16 under 35 U.S.C. 102(b) in view of ENLOE have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of ENLOE and TEJNIL.

51. On page 7 of Applicant Arguments/Remarks, Applicant argues that the protective means of ENLOE which may include the pellicle membrane and spacers, is not both transparent and contacting the reflective structure, as now required by the amended claim. This argument is persuasive.

52. However, new grounds of rejection have been made in view of ENLOE as modified by TEJNIL. Specifically TEJNIL teaches a method of attaching a pellicle to a mask by using a pellicle frame or support that is transparent to radiation (paragraph 0027). Therefore, it would have been obvious to use the transparent pellicle support in the pellicle of ENLOE, in order to get the benefit of reduced stress and distortion of the pellicle during attachment.

53. Applicant's arguments filed 05/28/2009 have been fully considered but they are not persuasive.

54. On page 8 of Applicant Arguments/Remarks, Applicant argues that the prior art is unable to provide a pellicle which is thick enough to protect from the interfering particles without interfering with the wavelength, and that conventional wisdom in the art tells that "protective means contacting the reflective structure" would not work. This argument is not persuasive.

55. The argument that the pellicle is thick enough to protect from the interfering particles without interfering with the wavelength is not persuasive because it is not a claim limitation. The claim limitation requires that protective means "contacting the reflective structure and transparent" and "contrived to keep interfering particles at a

distance from the patterns" and therefore does not define any thickness. The distance of ENLOE and TEJNIL is accomplished using the spacers to support the pellicle membrane the distance from the reflective mask. And the spacers of ENLOE may be made transparent with the teachings of TEJNIL, and therefore the protective means, which may be the spacer and membrane, will be contacting the reflective structure. This interpretation of the claim limitations if in accordance with the limitations of dependent claim 16 for example.

56. On pages 8-9 of Applicant Arguments/Remarks, Applicant argues that the teachings of SCOTT are not analogous to the present claimed invention. Specifically Applicant argues that SCOTT describes a capping layer which merely made to provide a highly planar surface to the mask in order to enable easier cleaning before adding the pellicle, which Applicant defines as the protective means. Applicant argues that since the capping material is the same material as the transmissive layer, that the material is most likely silicon. Thus Applicant argues that a person skilled in the art would know that a pellicle formed of this material which has the depth to protect from interfering particles is not transparent to the claimed wavelength. Applicant then argues that the layer disclosed in SCOTT is generally 50 to 80 nm thick, which is thirty times less than the typical depth of the protective means of the claimed invention. Therefore, Applicant argues that there is no way that SCOTT could be used in any useful way to provide a teaching on protecting from interfering particles. This argument is not persuasive.

57. First it is pointed out that the argument that the layer disclosed in SCOTT which is said to be 50 to 80 nm thick is thirty times less than the typical depth of the protective

means of the claimed invention is an argument that is not directed at claimed subject matter. Claim 1 recites "... contrived to keep interfering particles at a distance from the patterns which is greater than or equal to one of two values taken from a depth of focus of the device and a height of patter/interfering particles associated with a tolerated percentage of absorption of photons by the interfering particles which is a function of their diameter". Thus the distance, H, is defined as being either greater than the depth of focus, or a parameter associated with the size of the interfering particles. Dependent claim 12 then further defines the distance, H, as being between about 50 nm and about 5000 nm. Thus it is understood that a value between 50 nm and 5000 nm must inherently satisfy one of the two conditions for the distance as defined by independent claim 1.

58. The rejection as it presently stands defines the protective means of SCOTT as being the combination of the transmissive layer 260 and the capping layer 300. The transmissive layer may have a thickness of 100 nm to 150 nm, then using Applicant's numbers for the capping layer of 50 nm to 80 nm, the thickness of the protective means of SCOTT may be between 150 nm to 230 nm, which falls within the range for the distance, H, defined by claim 12. Therefore, since the protective means of SCOTT satisfies the structural limitations, of being able to keep particles at a distance, H, from the patterns by having a thickness of 150 nm to 230 nm, it must also satisfy the condition that it is also "greater than or equal to one of two values taken from a depth of focus of the device and a height of pattern/interfering particle associated with a tolerated

percentage of absorption of photons by the interfering particles which is a function of their diameter."

59. On page 9 of Applicant Arguments/Remarks, Applicant argues that SCOTT does not consider protecting the mask from interfering particles. Instead, Applicant argues that SCOTT is only interested in providing a capping layer. This argument is not persuasive.

60. As mentioned above, since SCOTT satisfies the structural limitations imposed by the claim, it must also be able to protect from the interfering particles, regardless of whether such a use was contemplated by SCOTT. However, in addition SCOTT teaches that the capping material may be used as a pellicle (column 11 lines 7-10). And pellicles are designed to be used to shield the mask from particles falling downward to the mask (column 2 lines 48-52). Specifically this is because a traditional pellicle cannot be used for shorter wavelengths, because SCOTT teaches at 193 nm wavelength and below a reaction occurs between the light and air trapped between the pellicle and the mask surface, creating ozone which breaks down the organic membrane film (column 3 lines 21-27), therefore the traditional pellicle would not be used in the teachings of SCOTT with a reflective mask.

Conclusion

61. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

62. YAN (US 5,928,817) teaches an EUVL mask with a protective capping layer (abstract). The mask comprises a substrate, with a reflective layer, a buffer layer, and an absorber layer on the buffer layer (column 2 lines 36-40). There is then a planarized protective capping layer over the absorber layer, the capping layer is transmissive to the wavelength of light to be used (column 2 lines 44-47). The capping layer may be made of amorphous silicon and is transmissive in EUVL light (column 4 lines 49-53). This capping layer is formed so as to form a protective film over the entire surface of the mask, even if particles fall onto the surface of the mask (column 5 lines 8-11). YAN teaches such a layer as an alternative to a pellicle (column 5 lines 13-15).

63. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

64. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

65. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Jelsma whose telephone number is (571)270-5127. The examiner can normally be reached on Monday to Thursday 7:00 a.m. - 4:00 p.m.

66. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on (571)272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

67. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/S. Rosasco/
Primary Examiner, Art Unit 1795

JGJ